# Yrast and Near–Yrast Excitations Up to High Spin in $^{100}_{48}Cd_{52}$

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The properties of nuclei close to $^{100}$Sn (N=Z=50) are of considerable interest. Results in this region have significance for understanding the origin of the effective interactions used in the shell–model description of nuclei. In particular, a strong motivation for these studies is to experimentally deduce effective nucleon charges ($e_{eff} = e(\frac{1}{2}+t_z)+e_{pol}$, where $t_z=+\frac{1}{2}$ $(-\frac{1}{2})$ for protons (neutrons); $e_{pol}$ is the polarization charge, reflecting the effect of a specific nucleon orbital on the shape of the core). The effective charge is directly related to the transition matrix elements between states and can be deduced from the measurement of lifetimes and branching ratios of transitions from these states. Such measurements, on several nuclei in this mass region, have yielded results which are contradictory. For instance, the effective proton charge, $e^{\pi}_{eff}$, deduced from $^{98}$Cd [1] ($e^{\pi}_{eff}$=0.9e) is a factor of two smaller than that previously deduced for $^{100}$Cd [2] ($e^{\pi}_{eff}$=1.8e). Moreover, for $^{98}$Cd, the deduced effective proton charge implies a negative polarization charge ($e_{pol}$ <0) which is very difficult to understand. Such considerations motivated the study of $^{100}$Cd reported here [3]. The gamma decay of excited states in the nucleus $^{100}$Cd, which is two proton holes and two neutrons away from doubly magic (N=Z=50) $^{100}$Sn, was studied with the Gammasphere array following the $^{46}$Ti($^{58}$Ni,2p2n) reaction at 215 MeV. Residues were identified by detection of evaporated charged particles in the Microball CsI array, by neutron detection in a set of liquid scintillator detectors, and by a tag on the delayed gamma–ray decay of the known $8^+$ isomeric state. The level scheme was extended up to $20\hbar$ in angular momentum and to nearly 10 MeV in excitation energy.

Shell–model calculations were compared with the data. The shell–model space involved protons in the $2p_{1/2}$, $1g_{9/2}$ orbits and neutrons in the $2d_{5/2}$, $3s_{1/2}$, $2d_{3/2}$, $1g_{7/2}$, $1h_{11/2}$ orbits. The spectrum of the yrast states up to I=14 was generally well reproduced. The electromagnetic matrix elements were obtained assuming effective charges of $e^{\pi}_{eff}$=1.5e and $e_{\nu}$=1.5e. Using this calculation the experimental branching ratios (for all observed transitions from states with I<14) were reproduced, as were the reduced transition probabilities for transitions from the known isomeric $8^+$ state (which is a relatively pure proton configuration of $\pi g^{-2}_{9/2}$). This suggests that the effective charge deduced for $^{98}$Cd is probably wrong and requires further investigation.

[1] M.Górska et al., Phys. Rev. Lett. 79 (1997) 2415

[2] M.Górska et al., Z. Phys. A 350 (1994) 181

[3] R.M.Clark et al., accepted Phys. Rev. C